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The Nuclear Reactor Industry: International Shakeout

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An Intelligence Assessment

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January 1983

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An Intelligence Assessment

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Office of Global Issues. Comments and queries are welcome and may be addressed to the Chief, Energy Issues Branch,

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Key Judgments

Information available as of 1 December 1982 was used in this report.

Escalating construction costs, high financing charges, and slow growth in electricity demand are causing many countries to cut back on their domestic nuclear power programs. Because of these cutbacks, nuclear reactor vendors are being forced to compete more aggressively for sales in the international market. The same factors that have plagued domestic reactor sales also trouble the export market and are compounded by the growing financial difficulties of many potential purchasers. During the next three to four years, no more than eight to 10 reactors are expected to be sold on the international market. China, South Korea, and Taiwan are the most likely purchasers.

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If both domestic nuclear power programs and the export market remain weak as we now expect, US firms will have difficulty garnering additional orders for new reactors for the balance of the decade. The French firm Framatome, with a relatively strong domestic nuclear program and subsidized financing for nuclear reactor exports, will remain the most aggressive US competitor for reactor sales on the international market. The West German and Canadian nuclear industries will remain tough competitors, but they will phase back on their production capability.

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Without a major turnaround in prospects for nuclear power reactor sales, we believe at least three nuclear reactor vendors will stop production. Given the support foreign governments give their domestic nuclear industry, we believe that two of the three reactor vendors stopping production will be US firms. The physical capacity to build nuclear reactors will not be diminished unless manufacturers opt to dismantle their surplus production capacity. While waiting for nuclear reactor orders to rebound in the early or late 1980s, most vendors will retrench and concentrate their business in the burgeoning nuclear service industry. As a result they would begin to lose the technicians and managers able to design and construct nuclear power plants.

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Although this shakeout should pose no significant difficulties in the next several years, it could leave the industry with insufficient trained manpower to meet a sharp resurgence in orders for nuclear power reactors in the 1990s. We do not expect US defense programs, such as the nuclear weapons program, to be significantly affected by this shakeout, but the US Navy will be affected. The US nuclear industry's manufacturing capability is contracting. The loss of suppliers will reduce competition and will result in greatly increased costs for sole-source specialty items. The Navy expects no major problem with its primary nuclear suppliers, but expects some problems at the subcontractor and secondary supplier level.

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Introduction

The nuclear reactor manufacturing industry is in a deep slump. Sluggish domestic reactor sales have increased the importance of the international market. Worldwide nuclear reactor exports have declined considerably from their peak in the early 1970s. According to industry reports, only 16 nuclear reactors have been sold on the international market during the past five years, down from an average of 13 per year in the first half of the 1970s. We expect the export market to remain at its depressed level for at least the next several years. At best, we expect only eight to 10 nuclear reactor export sales in the next three or four years.

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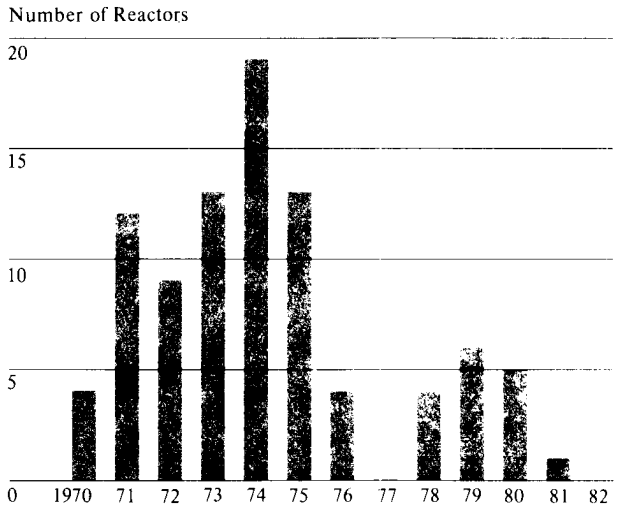
Figure 1
Worldwide Nuclear Reactor Exports



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Domestic Programs Cut Back

Six countries currently manufacture nuclear reactors for export: Canada, France, Sweden, West Germany, the USSR, and the United States. Almost across the board, domestic nuclear power programs in these countries are being cut back. Industry analysts report that high capital costs, high interest rates, regulatory uncertainties, and less than adequate return on equity have forced utilities to delay or cancel nuclear power reactor construction programs. Lower growth rates for electricity demand have reduced utility requirements for new electric generating capacity of any kind.

Some countries are faring better than others. Despite recent cutbacks, the French nuclear power program is large and continues to grow. Framatome, the French nuclear reactor vendor, is the sole reactor supplier for the French nuclear program. Strong government support for the program crystalized as a result of the 1973 oil crisis and subsequent efforts to reduce the strategic vulnerability stemming from dependence on unstable foreign oil suppliers. The French Government has made nuclear-generated electricity a cornerstone of its program to improve the security of energy supply. Electricite de France has been encouraged by government regulators to stimulate the use of nuclear-generated electricity through new rate structures offering reduced rates for residential electric space heating and for industrial customers within 30 kilometers of a nuclear plant.

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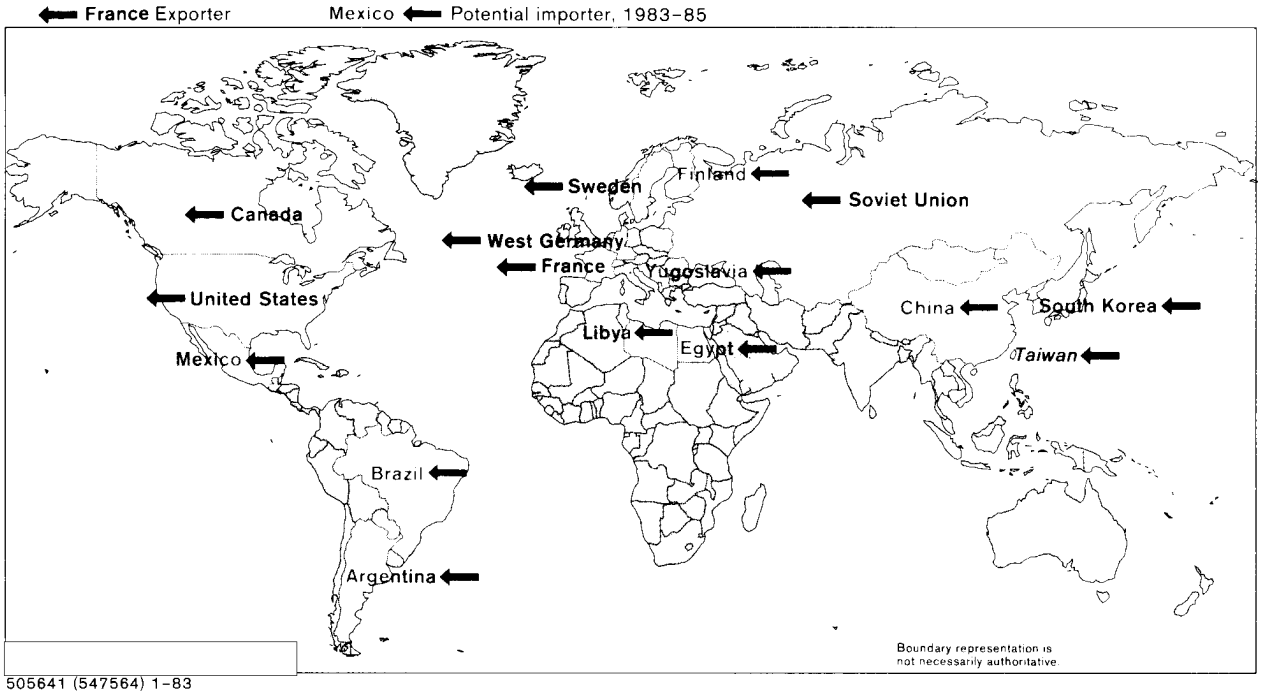
According to recent press reports, Paris now plans to cut back on construction of new nuclear power plants beginning in 1984. Recent French projections had forecasted a continuation of the 6-percent-per-year growth rate for electricity demand. Analysis indicated that this growth rate would require Electricite de France to order about three reactors per year. Over

Figure 2
Nuclear Reactor Exporters and Potential Importers



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the past three years, however, Electricite de France reports that electricity demand has stagnated and the only growth in electricity consumption was because of the startup of the final stages of the Eurodif Gaseous Diffusion Plant. As a result, Electricite de France is planning to reduce its order rate for nuclear reactors by as much as 50 percent.

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To counter the effect of these cutbacks on the nuclear industry, Paris probably will compete vigorously for sales in the international nuclear reactor market. France already offers preferential financing and less restrictive safeguards to improve its export sales prospects. During the past year or so, France seemed to be losing its enthusiasm for subsidized financing. We believe, however, that, because of the expected cutback in the French domestic nuclear power program, Paris will continue offering subsidized financing for nuclear reactor exports, although possibly at reduced levels.

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A referendum in 1980 limited Sweden's domestic nuclear power program to 12 nuclear power plants totaling 9,500 megawatts. All of these plants are in operation or under construction; thus, ASEA-Atom, the Swedish nuclear reactor vendor, must depend on export sales to survive as a vendor of nuclear power plants.

According to the Canadian Government, domestic requirements for nuclear generating capacity should be sufficient to sustain the Canadian nuclear industry in the long term. Near-term orders for Canadian reactors have slowed, according to industry reports, and Atomic Energy of Canada, Ltd., (AECL) is experiencing commercial difficulties. A Canadian Government study reports that no new reactor orders are needed to meet electricity requirements for the

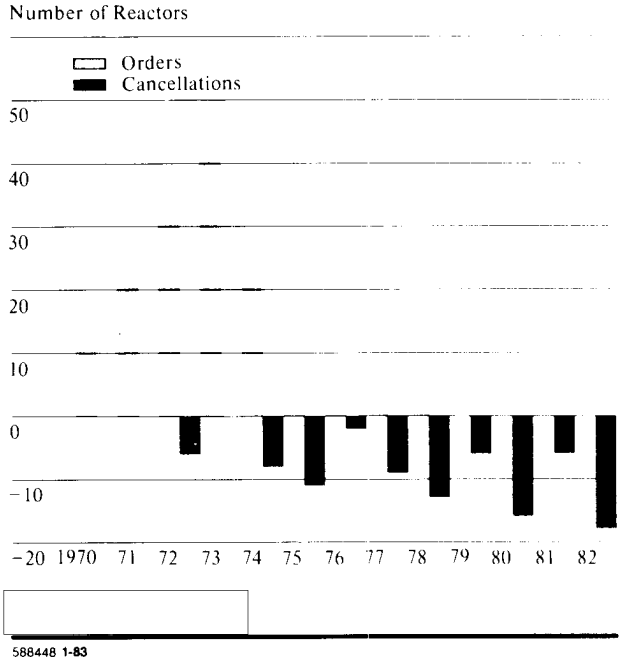
next several years. In addition, we believe the export market for AECL's reactors has dried up, at least for the next few years. As many as one-fourth of its employees were to be dismissed during November, according to AECL spokesmen. Although we do not yet have confirmation, we believe that AECL did carry out its plans to lay off employees.

We believe that Kraftwerk Union (KWU) in West Germany has already weathered its worst crisis. Since the mid-1970s, KWU has received no domestic orders for a nuclear power plant. Existing orders were tied up when the West German Government announced that no new reactors would be licensed until the utilities could demonstrate satisfactory arrangements for managing the back end of the fuel cycle and disposing of radioactive wastes. Industry assessments indicate that facilities to handle these tasks should be in place by the end of the decade. In addition, the government has a new streamlined licensing system, ending years of procedural delays. As a result, the West German nuclear power program is progressing for the first time in years. No new reactor orders have been placed yet, but press reports indicate that one partial construction permit has been issued and two more are expected before the end of this year.

Like that of France, the Soviet nuclear power program is large and continues to grow. The Soviet nuclear reactor vendor serves as sole supplier to the domestic nuclear power program. Atomenergoexport, the export arm of the Soviet reactor vendor, enjoys strong government support. Analysis indicates that the USSR has 33 nuclear power reactors in operation.

Given the strength of the domestic nuclear power program, we believe that the Soviet nuclear vendor will survive the decade even if Atomenergoexport receives no additional export orders. Nevertheless, we expect the Soviets to place heavy diplomatic and economic pressure on the Finns to purchase a Soviet nuclear power plant as they did in the early 1970s when they sold them two 440 megawatts-electric (MWe) reactors.

Figure 3
US Domestic Nuclear Reactor Orders and Cancellations



Although the US nuclear industry is the world's largest, it has been going through a lengthy period of stagnation. An industry trade group reported that US reactor vendors have received no domestic reactor orders since 1978 and have sold no reactors on the international market since 1979. Of the 13 domestic reactor orders placed since 1974, 11 have been canceled. A total of 95 nuclear power reactor orders have been canceled in the United States since 1971, and additional reactor plans have been delayed. Many experts project no new orders for nuclear reactors for the remainder of this decade. Reactor manufacturers will face increasingly severe problems as they work off their construction backlogs. In this decade, industry observers expect Babcock & Wilcox and Combustion Engineering to drop out of the nuclear reactor business unless either foreign or domestic orders can be found to sustain them. General Electric and Westinghouse have sizable construction backlogs to help sustain them through the decade.

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Major Export Potential for US Firms

Mexico. The first phase of Mexico's nuclear power program consists of two General Electric boiling water reactors with a total generating capacity of 1,308 MWe. These two reactors are in the mid-to-late stages of construction at Laguna Verde. In early June President Portillo's Economic Council decided to suspend the second phase of the Mexican nuclear power program because of Mexico's financial crisis. This phase of the program called for an additional 2,400 MWe at the Laguna Verde Nuclear Power Station. Further government plans calling for the installation of some 20,000 MWe of nuclear-electric generating capacity by the year 2000 have been abandoned.

The magnitude of the proposed Mexican nuclear program generated intense competition among nuclear reactor suppliers. According to the industrial press, seven nuclear reactor vendors from five countries submitted technical and financial bids to the Comision Federal de Electricidad, the Mexican national utility. The United States was well represented with bids from Combustion Engineering, General Electric, and Westinghouse.

At the time of the suspension, France and the United States appeared to be the leading candidates for the sales contract,

Mexican officials have indicated that while they believe US nuclear equipment and technology are superior to that offered by France they are not as certain about the United States as a reliable supplier. Nor do they have much interest in certain portions of the nuclear technology package included in the French reactor deal. If the Mexicans can be persuaded that the United States is a reliable nuclear supplier and that future administrations will honor commitments made by the Reagan administration, we believe that US reactor vendors would be virtually assured of winning the nuclear reactor export orders from Mexico if and when its nuclear power program resumes.

we believe it is unlikely that new contracts would be signed before 1984 or more likely 1985.

Potential Reactor Exports, 1982-85

Purchaser	Reactor	Capacity (MWe)	Likely Suppliers
Argentina	Atucha-3	690	Kraftwerk Union
Brazil	Iquape-1	1,245	Kraftwerk Union
	Iquape-2	1,245	Kraftwerk Union
China	Guangdong-1	950	Framatome or US supplier
	Guangdong-2	950	Framatome or US supplier
Egypt	El Daba-1	900	Framatome
	El Daba-2	900	Framatome
Finland	Loviisa-3	1,000	Framatome or Atomenergoexport
Libya	Surt-1	420 [a]	Atomenergoexport
	Surt-2	420 [a]	Atomenergoexport
Mexico	Laguna Verde-3	1,200	Framatome or US supplier
	Laguna Verde-4	1,200	Framatome or US supplier
South Korea	Undetermined	950	US supplier
	Undetermined	950	US supplier
Taiwan	Yenliao-1	950	Framatome
	Yenliao-2	950	Framatome
Yugoslavia	Prevlaka-1	1,000	US supplier

[a] This is the rated capacity for this reactor; however, the plant will be derated to provide process steam for desalination facilities.

South Korea. Seoul has one nuclear reactor, a 564-MWe Westinghouse pressurized water reactor in operation, and eight reactors totaling more than 6,800 MWe are in various stages of construction. Korean Government plans indicate that as many as 10 additional reactors are scheduled to be in operation by the year 2000. In the long term, Korea will remain a strong market for nuclear reactor sales, despite recent delays in the Korean nuclear program.

Except for the sale of a single Canadian CANDU reactor in the early 1970s, US vendors maintained a solid grip on nuclear reactor exports to Korea until

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1980, when Framatome's bid to construct the two-unit power project near Ulchin was accepted. Framatome won the contract in part by offering the Korea Electric Co. (KECO) the best public loan terms ever received by KECO. The US Embassy in Seoul reports that, under the loan agreement, seven French banks loaned Korea $1.25 billion at 7.5 percent interest. No payments are due for eight years; thereafter repayment is to be made in 15 equal annual payments. No other bidder was able to meet these financing terms. State Department reporting indicates that political considerations also played a role as Seoul wanted to broaden economic and political ties with France.

Although France may not be able to offer such generous financing terms in the future, we believe French nuclear reactor sales prospects in Korea look bright. France now has a solid entry in the Korean nuclear reactor market and can be expected to compete with Westinghouse on a more equal basis. Unless France can continue to offer below market financing, we believe Framatome and Westinghouse will divide the Korean nuclear market. French adoption of a proposed common line on credit terms for nuclear power plant financing would help improve the competitive position of US nuclear vendors. Political considerations, however, will remain a factor. If South Korea concludes that continued US military and political support is something that needs to be purchased periodically, we expect that US nuclear reactor sales prospects would be enhanced.

As of 1981 KECO had planned to order four more nuclear reactors, two in 1982 and two in 1984. Recent Korean press reports indicate that international bidding for the two reactors scheduled for 1982 has been officially postponed until 1983. In postponing the bidding, KECO acted upon recommendations of the Economic Planning Board. Financial strains and reduced growth rates for electricity demand were cited by the board as reasons for the delay. The Korean press also reports that bidding on the units originally scheduled for 1984 will be delayed by at least one and perhaps two or more years. We expect only two Korean reactor orders by 1985, and we believe US vendors are in a strong position to win these contracts unless France once again offers generous financing.

Taiwan. Like South Korea, Taiwan has an aggressive nuclear power program. Three nuclear power reactors are already in operation, and three more are under construction. Government plans call for 14 additional nuclear power plants to be in operation by the year 2000, bringing total installed nuclear-electric generating capacity to more than 20,000 MWe. Taiwan's ambitious nuclear program has generated considerable competition among suppliers. In the recent bidding, France has once again emerged as the most aggressive competitor to the US nuclear industry. Not only did France make a lower overall bid, but the financial package offered was a virtual replay of France's deal with South Korea. According to open-source reporting, Taiwan finally awarded the right to negotiate the nuclear reactor contract to a US reactor vendor in March. A British firm was awarded the right to negotiate the turbine-generator contract. We believe Taiwan is using this means to increase pressure on potential suppliers to improve the terms of the contract.

Despite the advanced stage of contract negotiations, slowing economic growth and actual declines in electricity demand have forced Taiwan to defer construction indefinitely. We believe that this delay may hurt US nuclear reactor suppliers. When bidding resumes in perhaps two or three years, we expect France to agree with the United States to a common line on financing for this particular project. France would then be qualified to sell nuclear reactors to Taiwan under the existing US-Taiwan safeguards agreement and under the trilateral United States–Taiwan–IAEA safeguards inventory arrangement. Under these circumstances, France should benefit from the Taiwanese decision to reduce dependence on US nuclear equipment and technology through the purchase of such equipment and technology from non-US sources. Although it is not clear if this factor influenced the decision to cancel recent contract negotiations, we believe it will improve French nuclear reactor sales prospects.

China. Beijing has seemed on the verge of committing itself to a nuclear power program and ordering Western nuclear reactor systems more than once during

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the past decade. In 1979 China nearly agreed to purchase two French 900-MWe nuclear reactors before breaking off negotiations.

Although the proposed Guangdong Nuclear Station has passed a number of hurdles, we anticipate additional delays. The State Council's recent decision to build a 1,200-MWe, coal-fired electricity generating plant may further delay approval of the Guangdong nuclear project, according to the American Consulate in Hong Kong.

The lack of a Sino-US nuclear cooperation agreement may prove an insurmountable obstacle, but, if resolved, we believe US nuclear reactor vendors could probably win any contracts resulting from the Guangdong nuclear project. State Department reporting indicates that Guangdong Province officials have a strong preference for US nuclear equipment and technology. Analysis of recent West German bids for nuclear steam supply systems indicates that they have not been very competitive. We believe that France will be the principle US competitor for these reactor export sales. If Paris were to offer subsidized financing accompanied by somewhat less restrictive safeguards requirements, US reactor vendors would find it very difficult to compete.

Yugoslavia. Belgrade has one reactor undergoing startup and testing—a 615-MWe Westinghouse pressurized water reactor at Krsko. A second nuclear power plant with a capacity of 1,000 MWe is planned.

a nuclear reactor manufacturer is to be selected for this project in 1984 and major contracts are to be awarded in 1985. Construction is expected to begin in 1987, and full-power commercial operation is scheduled for 1995. We believe US reactor manufacturers might win this sale if favorable financing terms can be arranged.

without a barter arrangement Yugoslavia's foreign trade deficits would prohibit the purchase of any additional nuclear power plants.

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Other Potential Sales

Argentina, Brazil, Egypt, Finland, and Libya are considering placing orders for nuclear power plants in the next several years. We believe US nuclear vendors stand little or no chance of securing any of these reactor sales. Brazil has previously selected Kraftwerk Union as its reactor supplier. Our analysis indicates that Argentina also favors the German firm. Although contracts have not been signed, Egypt and Libya have apparently selected non-US reactor suppliers. Finland is known to be evaluating French and Soviet technology. According to the press, Pakistan is seeking to purchase a nuclear power plant, but we expect Pakistan to be rebuffed because of its poor nuclear nonproliferation credentials and strong US pressure to prevent such a sale.

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Argentina has one German-built pressurized heavy water reactor (PHWR) in operation. Two additional reactors—a nearly complete Canadian CANDU reactor and a second larger German PHWR—are under construction. The Argentina Government has authorized the purchase of three more reactors scheduled to be in operation by the year 2000. Argentina's defeat in the Falkland Islands has caused severe financial strains, which have slowed the Argentine nuclear power program. Argentina had been expected to request bids for an additional nuclear power plant in 1982 or 1983, but these plans have been placed on hold. Nevertheless, we believe Argentina is strongly committed to its nuclear program and probably will order a reactor within the next three or four years. Kraftwerk Union appears to be the most likely vendor. Argentina has had ongoing problems with Canada over safeguards, costs, and construction delays on its nearly completed nuclear reactor at Embalse. In addition, we believe Argentina will not submit to the full-scope safeguards required by the United States.

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Brazil has one US-built reactor entering operation. Under a 1975 nuclear cooperation agreement with West Germany, Brazil is committed to purchase up to eight West German reactors. Two of these are in the early stages of construction. Contracts for the third and fourth are expected to be completed later this year. Indeed, the Brazilian press reports that site preparations are under way and component fabrication work has begun.

Egypt has plans to have eight nuclear power reactors totaling 8,400 MWe in operation by the year 2000. Egyptian Government officials have stated that France will almost certainly be awarded the contracts for the first two reactors. France has provided the technical bids for these reactors; financial terms have yet to be worked out. According to the US Embassy in Cairo, France may be willing to finance only one reactor at this time. The Egyptian Minister of Energy has stated that contracts for the third and fourth reactors will probably be awarded to a US nuclear reactor vendor. Financing, however, will be a crucial bargaining point. Given the soft oil market, we believe that lengthy delays in Egypt's nuclear power program are inevitable.

Finland's two Soviet-built pressurized water reactors and two Swedish-built boiling water reactors produced 34 percent of the country's electricity in 1981, according to industry trade publications. Imatran Voima Oy, the state-owned electric utility has studies under way with the Soviet Union and the French firm Sofratome concerning the feasibility of building a 1,000-MWe nuclear plant. The studies were to have been completed in 1982, and the US Embassy believes the Finns will opt to build a plant in 1983.

Libya has an agreement in principle to purchase a nuclear power plant from the Soviet Union. The plant will consist of two 420-megawatt pressurized water reactors that will be derated to supply steam for desalination facilities. Negotiations have been going on for several years. While Libya continues to hope that a contract can be signed sometime in 1983, significant differences remain. Even if a contract is signed soon, we believe that cash-flow problems, foreign exchange requirements, and substantial differences concerning the application of nuclear safeguards could delay contract implementation until the latter half of this decade. 25X1

Industry Shakeout Ahead 25X1

The international market for nuclear reactor exports continues to be depressed, and prospects for a recovery appear slim, at least in the near term. In the next three or four years, we expect no more than eight to 10 nuclear reactors will be sold on the international market. The bleak nuclear reactor export market has combined with a prolonged stagnation in most domestic nuclear power programs to threaten the vitality of the nuclear reactor vendors. Indeed, the world now suffers from severe overcapacity in the nuclear reactor component fabrication industry, and we expect an industrywide shakeout. 25X1

Framatome has sold eight nuclear power reactors for export, although two of these orders were canceled because of the Iranian revolution. Having captured 33 percent of the nuclear reactor export market in the past three years, France has emerged as the single most aggressive US competitor for nuclear power plant exports. Most countries have reported a preference for US nuclear technology and perceive French suppliers to be less experienced. To counter this view, Paris offers preferential financing and less restrictive safeguard agreements. In addition, we believe France's large and successful domestic nuclear power program will increasingly advertise French experience and capabilities. As this experience and expertise is demonstrated, we believe Framatome will be able to compete with US reactor manufacturers without having to rely on subsidized financing. Nevertheless, recent plans to cut back the French domestic nuclear power program argue strongly for the continuation of subsidized financing to increase export sales and to maintain employment levels in the French nuclear industry. 25X1 25X1 25X1

The Swedish nuclear reactor vendor, ASEA-Atom, may be the first casualty in this industry shakeout. Nine reactors have been built by ASEA-Atom, two of which were export sales to Finland. Two additional reactors are in the midstage of construction. With limits on Sweden's domestic nuclear power program and weakness in the current export market, we believe ASEA-Atom's chances for any nuclear reactor sales are slight. Indeed, press reports indicate that ASEA-Atom probably will reorganize as a nuclear service company to retain its skilled personnel.

A recent report by the Canadian Government indicates that the near-term prospects for Atomic Energy of Canada, Ltd., and the Canadian nuclear industry are not favorable. The report predicts a substantial contraction in the nuclear industry and suggests that direct government intervention may be necessary to preserve the nuclear power option. Press reports confirm that the industry already is retrenching, laying off employees, and expanding into the nuclear service sector. The government report indicates that the best near-term prospects for maintaining Canada's nuclear industrial capabilities are through additional reactor export sales and through the export of electricity generated by Canadian reactors.

The Canadian Government seems to be taking this report seriously. Indeed, the Minister of Energy has publicly expressed government support for the export of nuclear-generated electricity to the United States. Such a program would benefit the Canadian nuclear industry and generate considerable profit and foreign exchange earnings.

Despite opposition in Parliament, the Canadian Government is reported by the press to be considering the use of concessional financing to encourage foreign reactor sales. Over the longer term, we believe the Canadian nuclear industry will survive, albeit with reduced capacity.

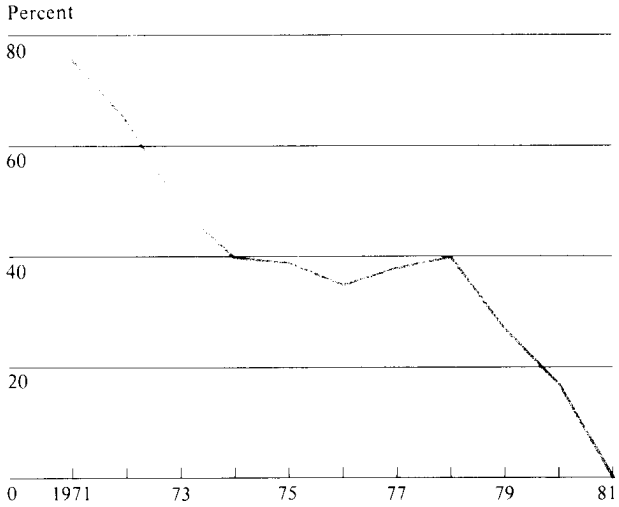
Kraftwerk Union (KWU), the West German reactor vendor, is expected to fare somewhat better, having already cut back its work force as a result of stagnation in the West German domestic nuclear power program beginning in the mid-1970s. While we expect KWU to remain in the nuclear business without direct government subsidy, it will continue to limp along at well below capacity. Kraftwerk Union has sold 11 reactors for export. Two of these orders were canceled because of the Iranian revolution. We expect a third export order, for Trillo-2 for Spain, to be canceled by the new Spanish Socialist Government. Except for potential reactor sales to Brazil, near-term export prospects do not look encouraging for the German nuclear industry; nevertheless, current and planned domestic nuclear power plant construction should be sufficient to ensure Kraftwerk Union's survival as a nuclear reactor vendor. In addition, KWU already has considerable business in the nuclear service sector in upgrading and retrofitting existing reactors to meet new safety requirements. 25X1

Atomenergoexport, the Soviet nuclear reactor vendor, enjoys strong government support for export reactor sales and has a nearly captive market for such sales to the Communist Bloc. The USSR has sold 32 reactors to the international export market. Finland is the only non-Communist country to have purchased Soviet-built nuclear power reactors, and we do not expect Atomenergoexport to compete much with the Western reactor export market. 25X1 25X1

Implications for US Vendors

Until the late 1970s, US manufacturers dominated the nuclear reactor export market. Westinghouse and General Electric have sold a total of 69 reactors on the international market. Because of increased competition, concessional financing, and negative reactions to the Nuclear Non-Proliferation Act of 1978, the US share of the world market for nuclear reactor exports has fallen steadily. Although US manufacturers have not sold a reactor for export since 1979, we believe US reactor vendors might secure orders from South Korea. China, Mexico, and Taiwan are other candidates for US sales in the next three or four years. Yugoslavia may also purchase a reactor of US manufacture, but probably not before the latter part of the decade. Although US export sales prospects have improved, competition will be fierce. On balance, we believe US manufacturers will be unable to capture more than about four export orders in the next 25X1 25X1 25X1

Figure 4
United States Share of Nuclear Reactor Export Market [a]



[a] Three-year moving average.

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few years. Unless these potential sales go to the weakest US nuclear reactor vendors, that is, Combustion Engineering or Babcock & Wilcox, export reactor sales will have little effect on the vitality of the US nuclear industry.

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Industry Outlook

Slack demand in both domestic and export markets has caused severe overcapacity in the nuclear reactor industry, and we expect an industrywide shakeout. As the decade progresses, we believe at least three nuclear reactor vendors will stop production. Those vendors remaining in the business will be operating at greatly reduced capacity. As orders are filled and the construction backlog is reduced, nuclear reactor vendors will be forced to concentrate more and more on the nuclear service business.

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Unless nuclear reactor vendors dismantle their surplus production capabilities, the physical capacity to build nuclear reactors will not diminish. Critical technical, engineering, and managerial skills, however, will be lost because, as the nuclear reactor vendors cut their construction backlog, the growing nuclear service industry will not be sufficient to absorb all those technical personnel. In addition, the nuclear service business requires a different mix of technical and engineering skills.

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As a result, we believe the skills necessary for the design, construction, and licensing of nuclear power plants will be dispersed. Although this loss of skills should pose no problem for the nuclear reactor vendors for the next several years, a sharp resurgence in orders in the late 1980s or early 1990s could find the industry with insufficient trained manpower. This is particularly true if construction leadtimes are slashed by streamlined regulations and the use of preapproved sites.

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